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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/914,913	12/17/2001	Peter Beyer		5922

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EXAMINER

KALLIS, RUSSELL

ART UNIT PAPER NUMBER

1638

DATE MAILED: 03/28/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/914,913	BEYER ET AL.	
	Examiner	Art Unit	
	Russell Kallis	1638	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 09 December 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 16 and 32-43 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 16 and 32-43 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 23 December 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Rejection of claims 53-59 under 35 U.S.C. 112, first paragraph, enablement, is withdrawn in view of Applicant's amendments.

Rejection of claims 53-58 and 59 under 35 U.S.C. 103(a), are withdrawn in view of Applicant's amendments.

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claims 1-15, 17-31 and 44-59 are cancelled. Claims 16 and 32-43 are pending and examined.

Claim Rejections - 35 USC § 102

Claims 16 and 32-43 remain rejected under 35 U.S.C. 102(b) as being anticipated by The Rockefeller Foundation, International Program on Rice Biotechnology; Workshop Report June 10-11, 1993. Potential for Carotenoid Biosynthesis in Rice Endosperm. This rejection is maintained for the reasons of record set forth in the Official action mailed 6/07/2005. Applicant's arguments filed July 12/09/2005, 2002 have been considered but are not deemed persuasive.

Applicant asserts that the disclosure of D1 represents early stage discussions and experiments by experts in the field to assessing the potential for carotenoid biosynthesis in rice and that there is no suggestion that the production of carotenoids in rice endosperm can be achieved via the current methods and that the D2 and D1 documents leave no certainty about what is required to achieve carotenoid accumulation in plant cells (response pages 7 and 8). Clearly this is incorrect. Applicant's attention is directed to page 7 of the D1 document.

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“Amidst optimism that the goal of accumulating nutritionally significant levels of carotenoid synthesis in rice endosperm could be achieved the meeting was adjourned.”

Further, the D1 document does describe successful transformation of tobacco with carotenoid biosynthetic genes from bacteria that were described as “stunning” because they showed that bacterial genes could work in plants (see page 3 of D1).

Applicant asserts that the D3 document does not qualify as 102(b) art (response page 8). The document is provided as evidence that the method presented by the D1 document inherently teaches the elements and method steps to achieve carotenoid biosynthesis in rice endosperm.

Applicant asserts that ζ -carotene accumulation was not demonstrated in the D2 reference (response page 8). Applicant is arguing limitations not found in the claims, since the claims are broadly drawn to carotenoids accumulating to an unspecified level in tissue that does not normally accumulate carotenoids.

The claims are broadly drawn to a method of producing a plant cell that accumulates carotenoids in normally carotenoid free tissue by transformation with a plant phytoene synthase and a *crtI* gene from *Erwinia uredovora* encoding a phytoene desaturase and plant cells transformed therewith.

Burkhardt P.K. *et al.* in Rice Genetics III; Proceedings of the Third International Rice Genetics Symposium; Khush G.S. Ed. 1996 (IRRI) International Rice Research Institute, pp.818-820 and Ye X. *et al.* Science, 14 January 2000; Vol. 287, pp. 303-305 are both presented as evidence that the method presented by the Rockefeller Foundation Workshop of June 1993 inherently teaches a method of producing a plant cell that accumulates carotenoids when transformed with a plant phytoene synthase and a *crtI* gene from *Erwinia uredovora* encoding a phytoene desaturase.

The Rockefeller Foundation report teaches a method of producing rice plant cells that accumulate carotenoids by transformation with genes encoding a phytoene synthases, a phytoene desaturases and a zeta carotene desaturases from the carotenoid biosynthetic pathways of bacteria, plants and fungi (see pages 3-6 and Appendices C-E); and tobacco transformed with genes from the entire beta-carotene pathway of *Erwinia herbicola* using the 35S CaMv promoter and Rubsco leader/transit sequence that produced orange seeds due to the accumulation of carotenoids (page 3, lines 13-19).

Burkhardt teaches accumulation of levels of phytoene (0.74 $\mu\text{g/g}$ dry weight) in endosperm cells of rice seeds transformed with a gene from daffodil (*Narcissus pseudonarcissus*) encoding a phytoene synthase and a gene from daffodil (*Narcissus pseudonarcissus*) encoding a phytoene desaturase on page 819, lines 27-33 and page 820, the entire paragraph; and that rice endosperm has no carotenoids (i.e. β -carotene and structurally related compounds) on page 819 lines 9-12, and therefore teaches a method of producing plant cells that accumulate carotenoid in endosperm cells of rice plants transformed with a gene encoding a plant phytoene synthase and phytoene desaturase relative to native levels of carotenoid and plants transformed thereby.

Ye teaches transgenic rice plants comprising a polynucleotide encoding a phytoene synthase from a plant (daffodil) and a phytoene desaturase *crtI* gene from *Erwinia uredovora* producing seeds with increased levels of alpha-carotene and betas-carotene in the seed endosperm relative to native seeds levels on page 304 column 1 1st full paragraph and in column 3 last paragraph and on page 305 in Figure 3; and therefore The Rockefeller reference teaches inherently, a method of producing plant cells that accumulate carotenoid by transformation with a gene from daffodil (*N. pseudonarcissus*) encoding a phytoene synthase and a gene from

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daffodil (*N. pseudonarcissus*) encoding a phytoene desaturase or by transformation with a gene from daffodil encoding a phytoene synthase and a bacterial *crtI* gene from *Erwinia uredovora* encoding a phytoene desaturase and plant cells and plants transformed thereby; and thus the reference teaches all the limitations of Claims 16 and 32-43.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 16 and 32-43 are rejected under 35 U.S.C. 103(a) as being unpatentable over Burkhardt P. *et al.*, in RICE GENETICS III; Proceeding of the Third International Rice Genetics Symposium; International Rice Research Institute (IRRI), 1996; Khush G. S. ed., in view of Bramley P. M., Pure and Appl. Chem., 1997; Vol. 69, No. 10; pp. 2159-2162.

The claims are broadly drawn to a method of producing a plant cell that accumulates carotenoids in normally carotenoid free tissue by transformation with a plant phytoene synthase and a *crtI* gene from *Erwinia uredovora* encoding a phytoene desaturase and plant transformed therewith.

Burkhardt teaches a method of transforming rice plants (*Liliopsida*) with DNA molecules capable of expressing in plant cells consisting of a phytoene synthase and phytoene desaturase from daffodil, using either the CaMV35S or the endosperm tissue specific rice *GtI* promoter, and the *hpt* hygromycin antibiotic selection gene under control of a constitutive promoter (page 819, lines 27-44); that rice milled endosperm has virtually no beta-carotene (page 818, lines 9-11); the

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availability of genes encoding the four necessary enzymes for beta-carotene biosynthesis in plants and bacteria (page 819, lines 16-22); and the accumulation of high levels of phytoene in the seeds of several lines of transformed rice plants (page 820, lines 1-2).

Burkhardt does not teach a bacterial phytoene desaturase encoding sequence fused to a sequence encoding the pea Rubisco small subunit transit peptide; a vector encoding system derived from *Agrobacterium tumefaciens*; or a plant transformed with a bacterial phytoene desaturase encoding sequence.

Bramley teaches a bacterial phytoene desaturase encoding sequence fused to a sequence encoding the pea Rubisco small subunit transit peptide and a plant transformed with a bacterial phytoene desaturase encoding sequence fused to a sequence encoding the pea Rubisco small subunit transit peptide (pages 2160 and 2161, Phytoene desaturase *CrtI* sections); and a vector encoding system derived from *A. tumefaciens* (page 2160, Phytoene synthase section).

It would have been obvious at the time of invention to modify the invention of Burkhardt to include the polynucleotide encoding the *Erwinia uredova* bacterial phytoene desaturase and the vector encoding system derived from *A. tumefaciens* of Bramley. One of skill in the art would have been motivated by the teachings of Burkhardt that the genes encoding the enzymes required for beta-carotene biosynthesis from plants and bacteria are available in the art, as also taught by Bramley and Applicant's specification; and that rice endosperm contains GGPP the substrate for phytoene synthase, and is thus a valuable tool for engineering provitamin A production, and by the success of Burkhardt in transforming rice with phytoene synthase (daffodil) and phytoene desaturase (daffodil) and expressing the plant phytoene synthase (daffodil) in the endosperm of rice seeds resulting in high levels of phytoene and by the success

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of Bramley in transforming tomato with bacterial phytoene desaturase (*Erwinia uredova*) resulting in the accumulation of beta-carotene in ripe fruit; that one would have had a reasonable expectation of success in transforming a rice plant with a plant phytoene synthase and a bacterial phytoene desaturase; and in producing provitamin A or beta carotene in the endosperm of rice.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

No claim is allowed.

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Any inquiry concerning this communication or earlier communications from the examiner should be directed to Russell Kallis whose telephone number is (571) 272-0798. The examiner can normally be reached on M-F 8:30-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Anne Marie Grunberg can be reached on (571) 272-0975. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Russell Kallis Ph.D.
March 13, 2006

RUSSELL P. KALLIS, PH.D.
PRIMARY EXAMINER

Russell Kallis